REMARKS/ARGUMENTS

Claims 1-2, 7-16, and 22-41 currently appear in this application. The Office Action of May 27, 2003, has been carefully studied. These claims define novel and unobvious subject matter under Sections 102 and 103 of 35 U.S.C., and therefore should be allowed. Applicants respectfully request favorable reconsideration, entry of the present amendment, and formal allowance of the claims.

Specification

The amendment filed January 27, 2003, is objected to under 35 U.S.C. 132 because it is said to introduce new matter into the disclosure. Independent claims 1, 13 and 16 have been amended to recite methods of making the substrate. The Examiner alleges that there is no support for dipping the chip into a boiling alkali solution or by binding an amino radical by irradiating the chip with ultraviolet light in an atmosphere of ammonia gas or by binding a carboxyl radical by dipping the chip into a solution containing a carboxyl radical or an epoxy radical. The Examiner further alleges that the specification fails to teach or provide support for "diamond like carbon."

It is respectfully submitted that the amendment filed January 27, 2003, added no new matter. The alleged

new matter can be found in the specification as filed as follows:

1. "dipping the chip into a boiling alkali solution" is described in Example 2 on page 120, first paragraph, the specific language being, "the test piece is picked up. After boiling the test piece in sodium hydroxide solution of 10 wt% for 15 minutes..."

2. "In an atmosphere of ammonia gas" is described in the specification as filed at page 8, lines 2-5, specifically, lines 2 and 3, "...aminating the radical by irradiating [with] ultraviolet radiation in ammonia gas..."

3. "Dipping the chip into a solution containing a carboxyl radical or an epoxy radical" can be found in the specification as filed a Examples 4-6 (pages 12-17 and Example 8, pages 21-22). In Examples 4-6, the carboxyl radical is one of sebacic soda, carbonic chloride, succinyl chloride, or malonic acid, in the absence of silane. The epoxy radical is described in Example 8 and is 3-gricydxypropyrutrimethoxyl.

In the present application, the term "dipping" is clearly used to mean that the chip is maintained within the liquid into which it is "dipped."

Claim 6 has been cancelled. However, it should be noted that "diamond like" carbon is the same as "diamond-like" carbon. Diamond-like carbon is described in the specification as filed at page 4, lines 25-26.

Rejections under 35 U.S.C. 112

Claims 1-2, 6-11, 13-16, 22-25 and 39-41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

This rejection is respectfully traversed. As described above, all of the ostensibly new matter was present in the specification as filed.

Art Rejections

Claims 1, 2, 9-11, 13-16 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Chrisey et al. as defined by Sumiya et al.

This rejection is respectfully traversed.

Chrisey uses silane rather than a natural diamond, a synthetic diamond, or a diamond like carbon, as claimed herein in the amended claims. The present invention does not use a silane. The present inventors discovered that, using natural diamond, synthetic diamond, or a diamond like carbon, a radical can bind directly to the substrate, even in the absence of a silane. Binding chloride is effected by irradiating the surface of the substrate with ultraviolet light in an atmosphere of chlorine gas. There is nothing in either Chrisey et al. or Sumiya et al. that teaches or even suggests this process. To add a carboxyl group, the present invention uses a solution containing a carboxyl radical, such as sodium sebacate, a carbonic chloride, a succinyl chloride, or a malonic acid; none of these is a silane. When a carboxyl radical from sodium sebacate, a carbonic chloride, a succinyl chloride, or malonic acid is bonded

to the surface of the substrate in the present invention, the substrate is bonded to a carboxyl radical with a hydrocarbon; this bonded radical contains no silane.

The compounds containing a hydrocarbon chain and a carboxyl radical are bonded directly to the surface of the substrate in the present invention. Chrisey et al. use a silane which includes at least one silicon atom in addition to the hydrocarbon chain and the hydroxyl, amino, epoxy, etc. radical.

It should also be noted that the thermal conductivity of synthetic diamond or a diamond like carbon is not described in Sumiya et al. Moreover, it is not understood why Fodor et al. is used in an anticipation rejection, in which only one reference should be used rather than a combination of references.

With respect to Fodor et al., this patent teaches that the roughened surface of a silicon increases the density of reagent attachment and reagent binding. However, the substrate in the present invention is natural or synthetic diamond or diamond-like carbon, which is not at all the same as silicon. The substrate of the present invention is not the same as that in Fodor et al., and the present invention does not use the sulfonyl compounds that Fodor et al. use. In the present invention, an atmosphere of chlorine gas or ammonia gas

is used in bonding a chloride or an amino radical to the surface of the substrate using ultraviolet light. Fodor et al., on the other hand, use ultraviolet light to **remove** a protecting group.

Claims 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chrisey et al. as defined by Sumiya et al. in view of Fodor et al.

This rejection is respectfully traversed. The present invention uses natural or synthetic diamond or diamond-like carbon for the substrate, and the present inventors discovered that groups can be bonded to these substrates without the need for a silane coupling agent. Sumiya et al. are completely silent on the thermal conductivity of synthetic diamond or diamond-like carbon. More importantly, compounds having both a hydrocarbon chain and a carboxyl group are bound directly to the substrate without the need for a silicon-based coupling agent, as required by Chrisey et al.

The teaching of Fodor et al. that a roughened silicon surface increases the density of reagent attachment and reagent binding adds nothing to the combination of Chrisey et al. and Sumiya et al., because Fodor et al. has nothing to do with bonding organic groups directly to a substrate without the need for a coupling agent. Moreover, the present invention does not

require the sulfonyl groups which Fodor et al. required. As noted above, Fodor et al. teach **away** from the present invention, because the present invention uses ultraviolet light in a chlorine or ammonia atmosphere to attach chloride or amino groups to the substrate, while Fodor et al. use ultraviolet light to **remove** protecting groups.

Claims 6-8 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chrisey et al. in view of Kobashi et al.

This rejection is respectfully traversed. The independent claims have been amended to clarify that there is a hydrocarbon radical in addition to the carboxyl radical or epoxy radical. Kobashi merely states that the affinity of diamond with bioidentifiers can be improved by chemical modification of the diamond film surface, and hence a good adhesion of bioidentifiers with diamond film can be achieved. Although Kobashi discloses radicals that can be used to modify the diamond substrate, there is no disclosure of **how** the diamond substrate should be chemically modified. Thus, Kobashi adds nothing to Chrisey et al. While a skilled practitioner might have been motivated to modify the diamond substrate of Chrisey et al. with a carboxyl radical as taught by Kobashi, there is no way that a skilled practitioner would have appreciated that the

carboxyl radical could be bound along with a hydrocarbon chain to the diamond substrate without the need for a silane coupling agent.

In view of the above, it is respectfully submitted that the claims are now in condition for allowance, and favorable action thereon is earnestly solicited.

Respectfully submitted,

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